

Claims:

1. A conservation tillage implement comprising:
 - a) a cultivator frame having three or more longitudinally spaced apart transverse cross-members;
 - 5 b) a plurality of individual coulter wheel assemblies;
 - c) a mounting means corresponding to each individual coulter wheel assembly; and,
 - d) three or more longitudinally spaced apart rows of laterally spaced apart individual coulter wheel assemblies, each coulter wheel assembly
 - 10 removably mounted on the frame using the mounting means, a coulter wheel assembly in a given row being staggered with respect to the coulter wheel assemblies in a longitudinally adjacent row.
2. The conservation tillage implement according to claim 1, wherein the coulter wheel assemblies are laterally adjustable.
- 15 3. The conservation tillage implement according to claim 1 or 2, wherein the coulter wheel assemblies are mounted on the transverse cross-members.
4. The conservation tillage implement according to any one of claims 1 to 3, wherein there are a plurality of transverse cross-members for a given row.
5. The conservation tillage implement according to claim 4, wherein the plurality
 - 20 of transverse cross-members are aligned along a common transverse axis.
6. The conservation tillage implement according to claim 5, wherein there is a transverse axis corresponding to each row.
7. The conservation tillage implement according to any one of claims 1 to 6, wherein a row comprises a plurality of individual coulter wheel assemblies.
- 25 8. The conservation tillage implement according to any one of claims 1 to 7, wherein all of the coulter wheel assemblies in a given row are laterally staggered with respect to all of the coulter wheel assemblies in a longitudinally adjacent row.
9. The conservation tillage implement according to any one of claims 1 to 8,
 - 30 wherein there are three to eight rows.

10. The conservation tillage implement according to any one of claims 1 to 9, wherein there are six rows.
11. The conservation tillage implement according to any one of claims 1 to 10, wherein there are eight rows.
- 5 12. The conservation tillage implement according to any one of claims 1 to 11, wherein each coulter wheel assembly is able to deflect upwardly in response to impact with an obstacle.
13. The conservation tillage implement according to any one of claims 1 to 12, wherein each coulter wheel assembly comprises a spring element and a
10 coulter wheel.
14. The conservation tillage implement according to claim 13, wherein the spring element comprises a coil spring having upper and lower shank ends extending tangentially therefrom.
15. The conservation tillage implement according to claim 14, wherein the coil
15 spring has a horizontal spring axis and wherein the lower shank end is permitted to deflect upwardly in response to impact with an obstacle.
16. The conservation tillage implement according to any one of claims 13 to 15, wherein the coulter wheel has a peripheral edge having a plurality of waves.
17. The conservation tillage implement according to claim 16, wherein each wave
20 has a crest and valley, the crests and valleys extending from the peripheral edge at an acute angle with respect to the radius.
18. The conservation tillage implement according to claim 17, wherein, in operation for conservation tillage of soil, the crests and valleys enter the soil at a nearly vertical orientation.
- 25 19. The conservation tillage implement according to any one of claims 1 to 18, wherein the mounting means is removable.
20. The conservation tillage implement according to any one of claims 1 to 19, wherein the mounting means is laterally adjustable.
21. The conservation tillage implement according to any one of claims 1 to 20,
30 wherein the mounting means is a bracket.

22. The conservation tillage implement according to any one of claims 1 to 21, wherein the mounting means permits rotational movement of the coulter wheel assembly about a vertical axis.
23. The conservation tillage implement according to claim 22, wherein the mounting means comprises a vertically extending hollow strut having a pair of opposed horizontal slots therethrough.
24. The conservation tillage implement according to claim 23, wherein the coulter wheel assembly comprises a shank having a horizontal hole therethrough and wherein the shank is secured within the hollow strut by means of a horizontal pin extending through the slots and the hole, thereby permitting rotational movement of the shank within the hollow strut about the vertical axis.
25. The conservation tillage implement according to any one of claims 22 to 24, wherein the mounting means comprises bushings within the hollow strut at a top and bottom thereof to facilitate rotational movement of the shank within the strut.
26. The conservation tillage implement according to claim 25, wherein the bushings comprise a nylon material.
27. The conservation tillage implement according to any one of claims 1 to 26, further comprising one or more leveling attachments mounted to a rear of the frame.
28. The conservation tillage implement according to claim 27, wherein the leveling attachments comprise spike harrows, leveling bars, or rotary harrows.
29. The conservation tillage implement according to any one of claims 1 to 28, further comprising removable individual field working tools.
30. The conservation tillage implement according to claim 29, wherein the field working tools are located in longitudinally spaced apart rows and wherein the field working tools are staggered with respect to the coulter wheel assemblies or field working tools in a longitudinally adjacent row.
31. The conservation tillage implement according to any one of claims 1 to 30, wherein a plurality of coulter wheel assemblies in a given row are mounted on the same transverse cross-member.

32. The conservation tillage implement according to any one of claims 1 to 31, wherein one or more coulter wheel assemblies in a given row are mounted on different transverse cross-members.
33. The conservation tillage implement according to any one of claims 1 to 32,
5 wherein one or more coulter wheel assemblies are longitudinally spaced apart from the transverse cross-member.
34. The conservation tillage implement according to claim 33, wherein the one or more coulter wheel assemblies are mounted to the frame by means of a longitudinal extension member.
- 10 35. The conservation tillage implement according to any one of claims 1 to 34, wherein there are a plurality of rows for a given transverse cross-member.
36. The conservation tillage implement according to claim 35, wherein the coulter wheel assemblies in the longitudinally adjacent row are longitudinally spaced apart from the transverse cross-member.
- 15 37. A kit for making a conservation tillage implement according to any one of claims 1 to 36 from an existing cultivator frame comprising:
- a) a plurality of coulter wheel assemblies;
 - b) a plurality of mounting means for mounting the coulter wheel assemblies to the cultivator frame; and,
 - 20 c) a set of instructions for mounting the coulter wheel assemblies to the cultivator frame using the mounting means.
38. The kit according to claim 37, wherein the kit further comprises a stilt means for increasing the height of the cultivator frame relative to ground level.
39. The kit according to claim 37 or 38, wherein the kit further comprises a
25 hydraulic cylinder.
40. A method of assembling a conservation tillage implement comprising:
- a) providing a cultivator frame have longitudinally spaced apart transverse cross-members;
 - b) providing a plurality of individual coulter wheel assemblies;
 - 30 c) providing a mounting means for each coulter wheel assembly; and,

- d) removably mounting the coulter wheel assemblies to the frame using the mounting means to form three or more longitudinally spaced apart rows of laterally spaced apart coulter wheel assemblies, a coulter wheel assembly in a given row being staggered with respect to the coulter wheel assemblies in a longitudinally adjacent row.

41. A system for conversion of a field working implement between a conservation tillage implement and a conventional tillage implement, the system comprising:

- a) a cultivator frame having longitudinally spaced apart transverse cross-members;

- b) three or more longitudinally spaced apart rows of laterally spaced apart individual coulter wheel assemblies or field working tools removably mounted to the frame; and,

- c) the conversion comprising exchanging field working tools with coulter wheel assemblies, or, exchanging coulter wheel assemblies with field working tools.

42. A system for mounting a coulter wheel assembly to a cultivator frame comprising:

- a) a mounting means comprising opposed first and second flanges for clamping engagement with the frame and a vertically extending hollow strut secured to the first flange, the strut having a pair of opposed horizontal slots therethrough; and,

- b) a coulter wheel assembly comprising a vertical shank having a horizontal hole therethrough, the shank secured within the hollow strut by means of a pin extending through the slots and the hole to thereby permit rotational movement of the shank within the hollow strut about a vertical axis.

43. A method of conservation tillage comprising:

- a) providing a field containing standing water, wet soil, and crop residue;
- b) providing a conservation tillage implement comprising spaced apart rows of staggered individual coulter wheel assemblies; and,

c) operating the conservation tillage implement in the field through the standing water to cut and size the crop residue.

44. The method according to claim 43, wherein the crop residue comprises rice, rice stalks, or rice paddies.

5 45. The method according to claim 43 or 44, wherein the standing water has a depth of between 0.5 and 12 inches.

46. The method according to any one of claims 43 to 45, wherein the standing water covers substantially the entire field.

10 47. The method according to any one of claims 43 to 46, wherein the implement is operated at a speed in excess of 8 miles per hour.

48. A method of conservation tillage comprising:

a) providing a field containing crop residue;

b) providing a conservation tillage implement comprising spaced apart rows of staggered individual coulter wheel assemblies; and,

15 c) operating the conservation tillage implement at a speed in excess of 8 miles per hour to cut and size the crop residue.

49. A method according to claim 48, wherein the implement is operated at a speed of less than 20 miles per hour.

20 50. Use of a conservation tillage implement according to any one of claims 1 to 36 in the conservation tillage of a field containing standing water, wet soil, and crop residue.